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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,863	09/11/2003	Chih C. Shih	200209582-2	8677

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HEWLETT-PACKARD COMPANY  
Intellectual Property Administration  
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EXAMINER

PRUCHNIC, STANLEY J

ART UNIT PAPER NUMBER

2859

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/660,863

Applicant(s)

SHIH ET AL.

Examiner

Stanley J. Pruchnic, Jr.

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 September 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

1. Claim 17 is objected to because of the following informalities:

In Claim 17, in Line 3, "such precision" lacks antecedent basis.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by OSONE *et al.* (U. S. Patent Application Publication No. US 2003/0072349 A1, hereinafter **OSONE**).

**OSONE** discloses a test method, comprising:

squeezing a thermal interface material (TIM) sample 1 (, e.g., a resin 1) at a plurality of different pressures (magnitude of load) at different times [Paragraphs 0031-0032];

flowing heat [para. 0059] through said TIM sample to create a thermal gradient (see Figs. 1, 6 and 7) between a heat source and a cold sink at each of said plurality of different pressures;

measuring temperatures [para. 0064] at a plurality of points along said thermal gradient at respective ones of said plurality of different pressures; and

characterizing the thermal material properties [para. 0087] of said TIM sample from calculations based on data obtained in the step of measuring as claimed by Applicant in Claim 1.

**OSONE** further discloses maintaining a constant pressure [paras. 0099-0100] at each of said plurality of different pressures in spite of any thermal expansions of said TIM sample during a test as claimed by Applicant in Claim 2.

**OSONE** further discloses delaying the step of characterizing until temperature measurements in the step of measuring have reached a steady-state [para. 0008, constant amount of heat flow, stationary method] as claimed by Applicant in Claim 3.

4. Claims 1-3 and 8-9 are rejected under 35 U.S.C. 102(b) as being anticipated by **AUDET et al.** (U. S. Patent No. 3,817,109, hereinafter **AUDET**).

**AUDET** discloses a test method, comprising  
squeezing a thermal interface material (TIM) sample 84, 85 at a plurality of different pressures at different times; flowing heat through said TIM sample to create a thermal gradient between a heat source (70) and a cold sink (86, 87) at each of said plurality of different pressures;

measuring temperatures at a plurality of points along said thermal gradient at respective ones of said plurality of different pressures (Col. 6, Lines 7-63); Col. 7, Lines 34-48); and

characterizing the thermal material properties of said TIM sample from calculations based on data obtained in the step of measuring as claimed by Applicant in Claim 1.

**AUDET** further discloses maintaining a constant pressure (Col. 2, Lines 45-48; Col. 7, Lines 34-50) at each of said plurality of different pressures in spite of any thermal expansions of said TIM sample during a test as claimed by Applicant in Claim 2.

**AUDET** further discloses delaying the step of characterizing until temperature measurements in the step of measuring have reached a steady-state (thermal equilibrium; Col. 7, Line 6) as claimed by Applicant in Claim 3:

**AUDET** further discloses computing a thermal resistance curve across intervening hot and cold blocks along said thermal gradient to extrapolate interface temperatures on opposite sides of said TIM sample; and using such interface temperatures in a calculation of the thermal resistance of said TIM sample at each of said plurality of different pressures; determining a relationship between temperature and distance along each of the hot and cold blocks at steady-state with simple linear regression as claimed by Applicant in Claims 8-9.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over **AUDET** in view of **EI-HUSAYNI** (U. S. Patent No. 5,940,784).

AUDET, to summarize, discloses all the limitations as claimed by Applicant in Claims 9-10, as described above in Paragraph 4 as applied to Claims 1-3 and 8-9, further including the limitations of delaying the step of characterizing until temperature measurements in the step of measuring should have reached a steady-state (Col. 3, Lines 35-54); determining a particular set of pressures to use in the step of squeezing (See Fig. 4); AUDET would, in normal operation, observe a time delay needed for steady-state thermal conditions when he observes the steady-state conditions; and AUDET would, in normal operation, determine heating and cooling requirements needed to establish said thermal gradient in order to operate the testing apparatus.

AUDET as described above, does not explicitly disclose the use of trial runs as claimed by Applicant in Claims 4-7.

EL-HUSAYNI discloses a test method in the same field as AUDET, for measuring thermal properties of a specimen. EL-HUSAYNI discloses an automated method wherein the measurements are repeatedly done until values are within a range indicating thermal equilibrium has been established.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include trial runs to determine optimum conditions are met as already suggested by AUDET, and to determine when thermal equilibrium has been established as taught by EL-HUSAYNI.

8. Claims 10-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over **OSONE** in view of **STANLEY et al.** (U. S. Patent No. 3,733,887, hereinafter **STANLEY**).

OSONE discloses a materials testing system, comprising:

a fixture (Fig. 7) for placing a thermal interface material (TIM) between a hot 4 and a cold 5 block;

a press 11 for squeezing the TIM between the hot and cold blocks at a plurality of pressures and for a plurality of durations according to a test profile;

a heater 7 and cooler 8 connected to the hot and cold blocks for creating a thermal gradient across the TIM;

a compensating controller (HEIGHT/LOAD CONTROL; Fig. 6) adjusting the pressure applied to the TIM to be constant even though said TIM sample expands and contracts with changes in its temperature [Paragraphs 0031-0032];

a set of sensors [e.g., Paras. 0064, 0072] for collecting temperature information (T1, T2; T5, T6) from the hot 4 and cold 5 blocks during the steps of squeezing and creating; and

a computer ("COMPUTING/CONTROL DEVICE (PC)") for building a thermal-resistance-curve model of said TIM sample from data obtained in the step of collecting temperature information as claimed by Applicant in Claim 10.

OSONE further discloses a gauge for measuring the thickness of said TIM sample, strategic placement of thermocouples, and a computer which is capable of calculating a least-squares fit as claimed by Applicant in Claims 11-13.

OSONE as described above, does not teach the hot and cold blocks are made of copper as claimed by Applicant.

Regarding the method steps: The steps as claimed by Applicant in Claims 15-23 are met in the normal operation of the device of OSONE, as described above, and further including placing the material in the fixture, squeezing (applied load; OSONE disclosed this is done at a constant pressure(s) according to a test profile in order to provide measured thermal data for the sample at each of the pressures; adjusting the pressure(s) to be constant, as stated above, and building a thermal resistance curve model. Moreover, regarding Claim 16, OSONE describes the plates as parallel, this not being operator dependent, and the system uses a computer for "offline" measurement, understood to be calculations as claimed by Applicant in Claim 17. Regarding the particular load range, from a few pounds to in excess of 400 pounds, although not explicitly disclosed, absent criticality, the method of OSONE would inherently include using pressures within the claimed range. OSONE suggests measuring sample load and deflection and correlating these measurements as claimed by Applicant in Claims 22 and 23.

OSONE, to summarize, is shown to teach or suggest all of the limitations as claimed by Applicant, with the exception of the hot and cold blocks being made of copper.

STANLEY discloses that is known in the art to provide a thermal property measurement device with copper blocks because copper is a good thermal conductor.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use copper for the hot and cold blocks of OSONE in order to benefit from the high thermal conductivity as taught by STANLEY.



### **Conclusion**

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art cited in a form PTO-892 and not mentioned above disclose related thermal property (e.g., thermal resistance or thermal conductivity) measurement devices and methods.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stanley J. Pruchnic, Jr., whose telephone number is **(571) 272-2248**. The examiner can normally be reached on weekdays (Monday through Friday) from 7:30 AM to 4:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego F. F. Gutierrez can be reached at **(571) 272-2245**.

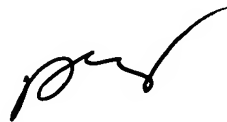
The **Official FAX** number for Technology Center 2800 is **(703) 872-9306** for **all official communications**.

Any inquiry of a general nature or relating to the status of this application or proceeding may be directed to the official USPTO website at **<http://www.uspto.gov/>** or you may call the **USPTO Call Center** at **800-786-9199** or 703-308-4357. The Technology Center 2800 Customer Service FAX phone number is (703) 872-9317.

The cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site ([www.uspto.gov](http://www.uspto.gov)), from the Office of Public Records and from commercial sources.

Private PAIR provides external customers Internet-based access to patent application status and history information as well as the ability to view the scanned images of each customer's own application file folder(s).

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7/12/04